

SPOT HRV-XS
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Change Detection Using Digital Satellite Data
Case study: The Holly City of Makkah and its Surroundings

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Abstract

Monitoring and detecting changes of land cover and land use are very

important in planning. Satellite data is an ideal tool to monitor changes on a regular basis. There are numbers of methods developed for using satellite data to detect changes. Among these methods is the principal component analysis (PCA).

This study aimed to evaluate the potentials of PCA for detecting changes in the City of Makkah and the surrounding areas during 1992-1998, using SPOT HRV-XS data. Another aim was to develop and test several PCA's procedures for detecting changes.

Two methods containing four different procedures were used to achieve the objectives of this study. The procedures are: (1) threshold (2) classification of all merged PCs (3) classification of selected merged PCs (4) classification of selected individual PCs.

The study concluded that threshold is the most accurate and the simplest for change detection. However, defining threshold is value is very critical and could be influenced by the user's opinion. This study also found the magnitude of changes in the study area is about 10 square kilometers. 58% of these changes is related to vegetation loss or gain. The remaining percentage is for ground construction build up.

Mouat, et al., (1993)

change detection

Macleod and)

.(Congalton, 1998

brightness values

digital numbers

.digital satellite images

visual observation

digital image processing

principal components analysis .

principal axis .variance

(Show and Wheeler, 1985)

transformation

Jensen, et al.)

spectral bands .(1997

(Byrne, at el., 1980

accuracy level

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Fung, 1992; Macleod and Congalton, 1998; Martin, 1989; Michener and Houhoulis.)

(1997

Green, et al., 1994)

(Fung, 1992)

Charbonneau, at al.,) (1993(Jensen, 1981

Muchoney and

(Haack, 1994

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geometric

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.correction

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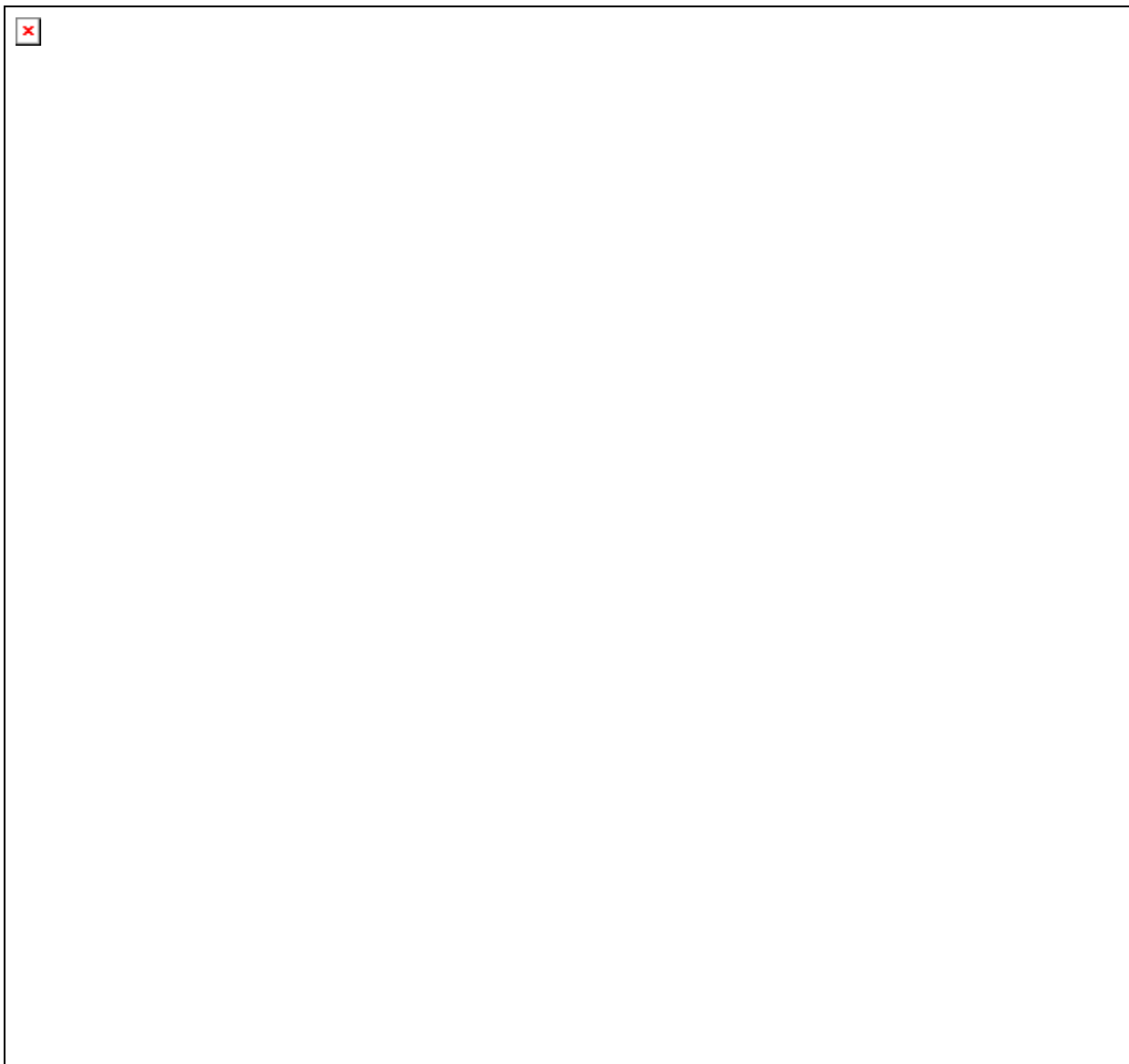
.(Hooper and Lee, 1990)

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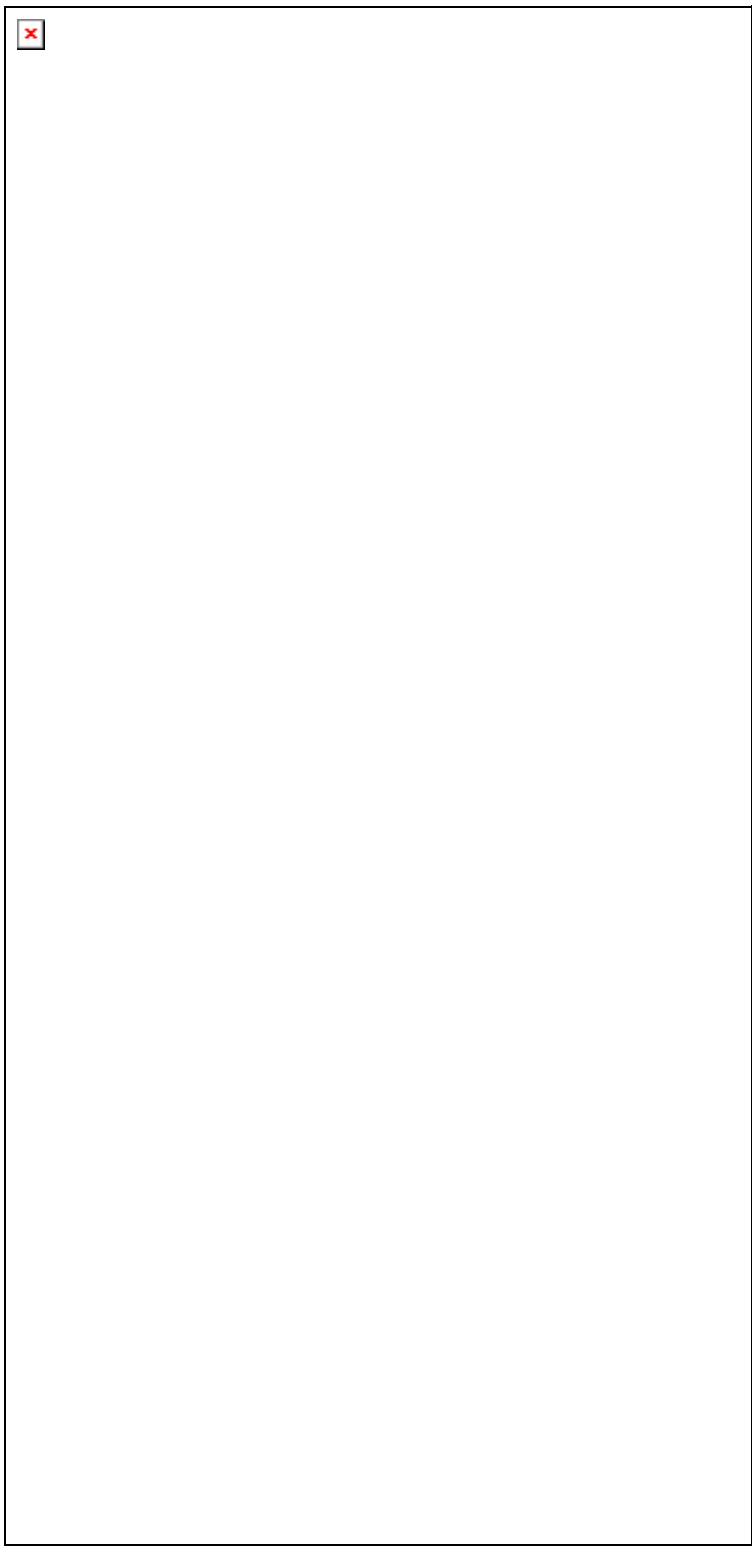
the mean difference

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HRV-XS



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Earth)

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(Resource Mapping, 1998

color composite images

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common brightness

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threshold

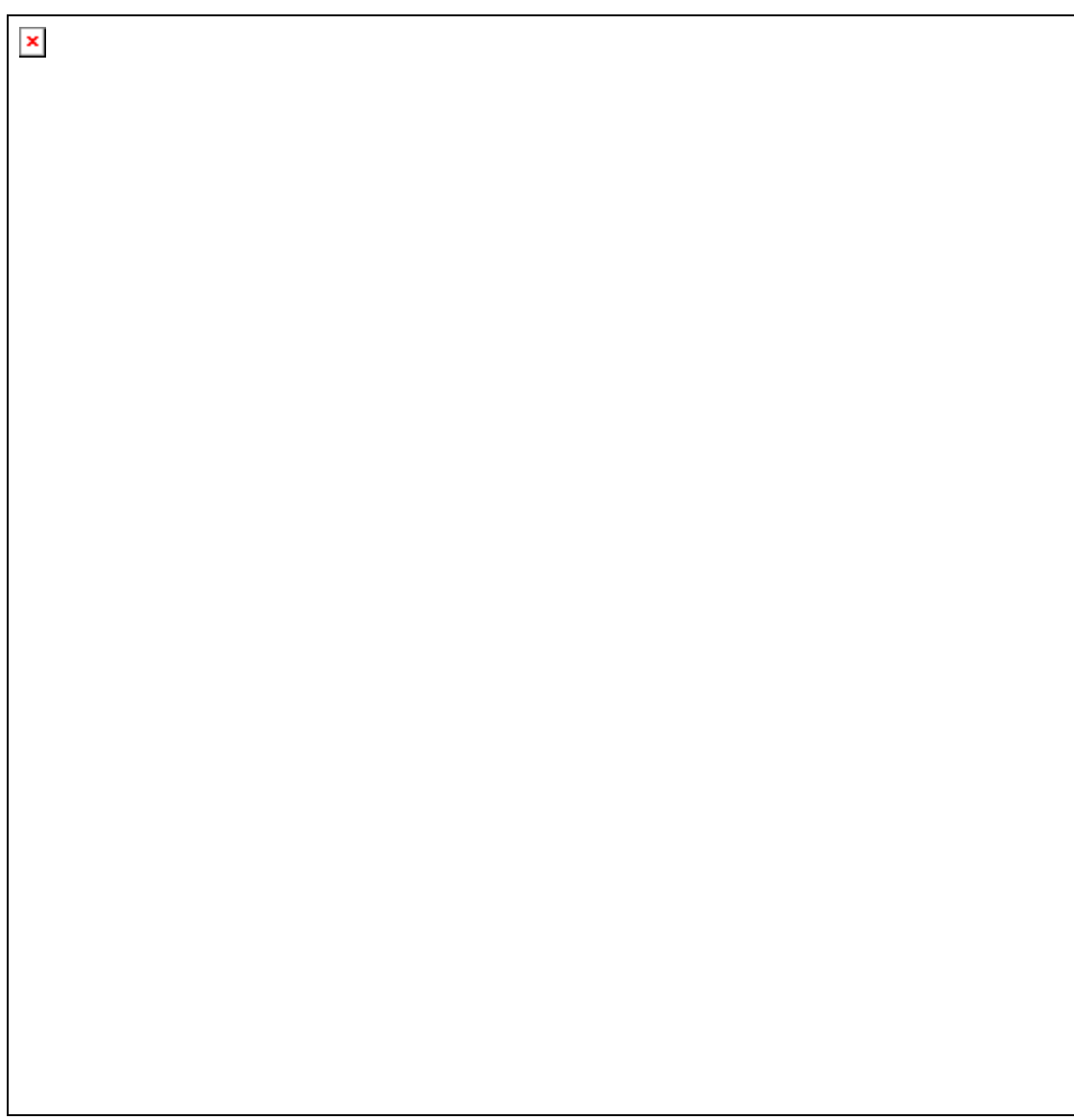
Lillesand and Kiefer,

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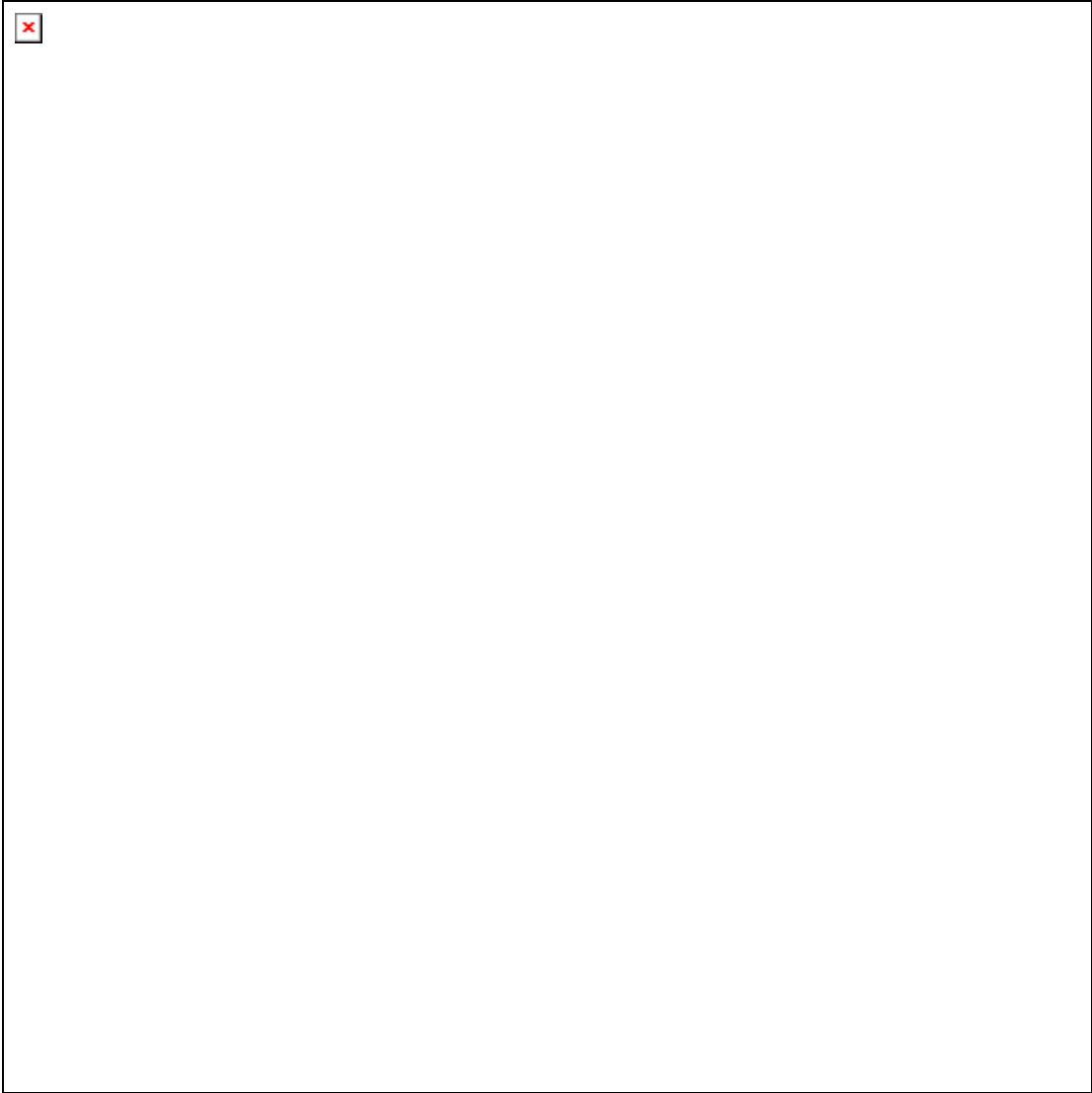
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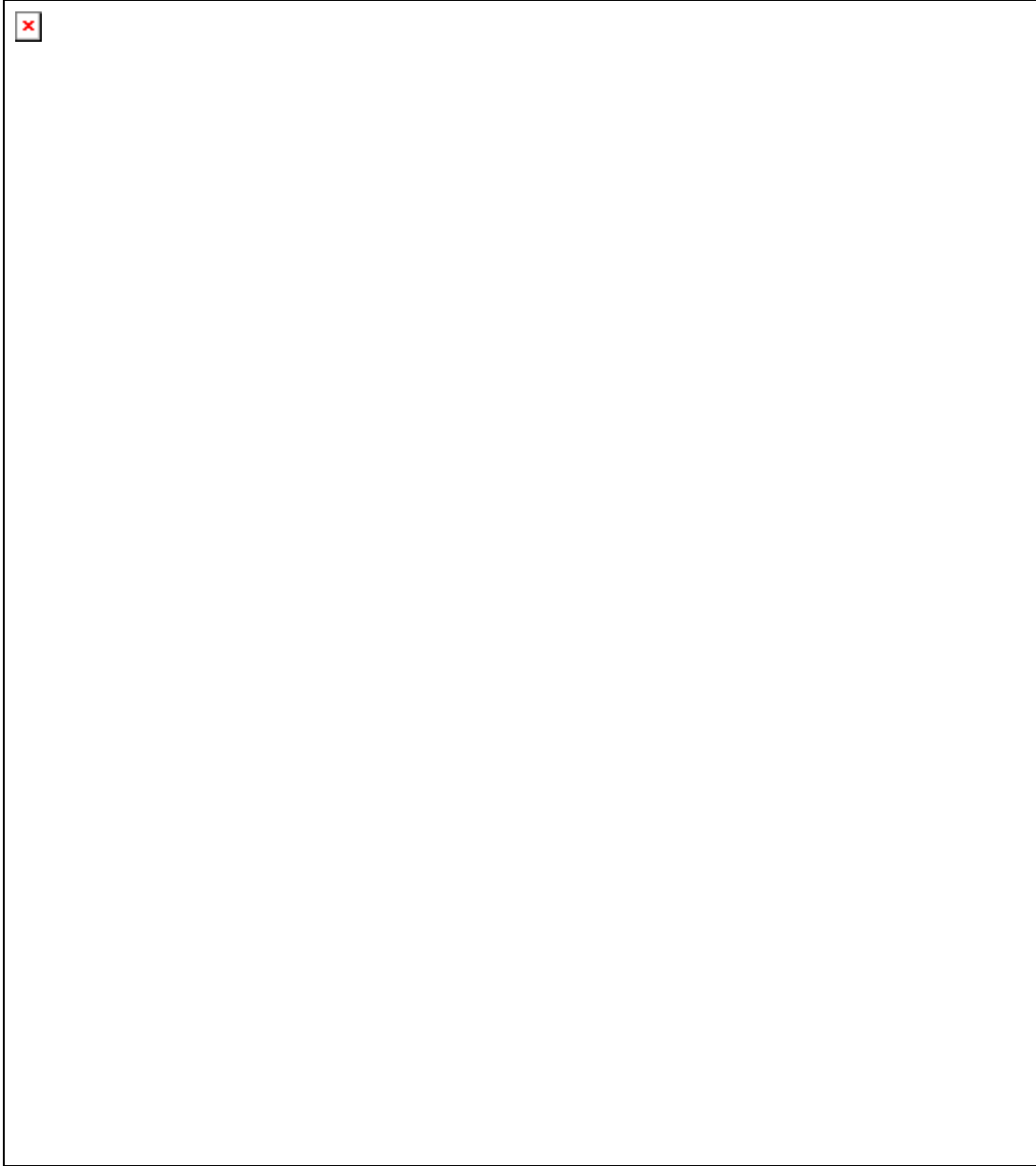
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Changes by Principal Components Analysis of Multispectral Data. Remote Sensing of Environment. 10:175-184.

2. Charbonneau, D., D. Morin, and A. Royer, 1993. *Analysis of Difference Methods for Monitoring Urbanization Process. Geocarto International, 8:17-27.*

3. *Earth Resource Mapping, 1998. ER Mapper User Guide (Chapter 7). Earth Resource Mapping. UK.*

4. Fung, T., 1992. *Land Use and Land Cover Change Detection with Landsat MSS and SPOT HRV Data in Hong Kong, Geocarto International. 7(3):33-40.*

5. Green, K., D. Kempka, and L. Lackey, 1994. *Using Remote Sensing to Detect and Monitor Land-Cover and Land-Use Change. Photogrammetric Engineering & Remote Sensing, 60 (3):331-337.*

6. Hoffer, M. and Kyu-Sung Lee. 1990. *Change Detection of Forest Cover Using Satellite Radar Data. Proceedings of the Third Forest Service Remote Sensing Applications Conference. Tucson, Arizona. pp. 349-355.*

7. Jensen, R. 1981. *Urban Change Detection Mapping Using Landsat Digital Data. The American Cartographer, 8:(2):127-147.*

8. Jensen, J., D. Cowen, S. Narumalani, and J. Halls, 1997. *Principle of Change Detection Using Digital Remote Sensor Data. In "Integration of GIS and Remote Sensing. Cambridge Univ. Press, pp. 37-54.*

9. Lillesand, T., and R. Kiefer. 1987. *Remote Sensing and Image Interpretation. John Wiley & Sons.*

10. Macleod, R., and R., Congalton. 1998. *A Quantitative Comparison of Change-Detection Algorithm for Monitoring Eelgrass from Remotely Sensed Data. Photogrammetric Engineering & Remote Sensing, 64 (3):207-216.*

11. Martin, L., 1989. *Accuracy Assessment of Landsat-Based Visual Change Detection Methods Applied to the Rural-Urban Fringe. Photogrammetric Engineering & Remote Sensing, 55(2):209-215.*

12. Michener, W. and P. Houhoulis. 1997. *Detection of Vegetation Changes Associated with Extensive Flooding in a Forested Ecosystem. Photogrammetric Engineering & Remote Sensing, 63 (12):1363-1374.*

13. Mouat, D., G. Mahin, and J. Lancaster, 1993. *Remote Sensing Techniques in the Analysis of Change Detection. Geocarto International 8:39-50.*

14. Muchoney, D., and B. Haack. 1994. *Change Detection for Monitoring Forest Defoliation. Photogrammetric Engineering & Remote Sensing, 60 (10):1243-1251.*

15. Show, G. and D. Wheeler, 1985. *Statistical Techniques in Geographical Analysis .John Wiley & Sons.*